

Coatings
Corrosion
Fracture and Mechanical Testing
High Temperature Mechanical Properties
Hydrogen Production and Storage Materials
Hydrogen Separation Materials
Irradiation
Materials Validation
Microstructure and Physical Properties
Modeling
Neutron Radiography
Nondestructive Evaluation
Post-irradiation Examination
Synthesis and Processing of Novel Materials
Welding and Joining
X-Ray Radiography

Welding and Joining

Capabilities/Facilities

Gas metal arc welding, gas tungsten arc welding, plasma arc welding, submerged arc welding, laser welding, hybrid laser arc welding, friction stir welding, resistance welding, electron beam welding; Gleeble testing; computer numerical control machining; robotic welding cell; welding of fuel elements and actinide-bearing materials.

Materials

Carbon steels; stainless steels; nickel-, cobalt- and tantalum-based alloys; aluminum alloys; advanced polymers; oxide dispersion strengthened (ODS) alloys; fuel cladding materials and actinide materials.

Scientific/Engineering Issues

Intelligent machines research, intelligent sensors development, mathematical algorithm formulation for image processing, application of game theory to decision making, prototype machine design and fabrication, advanced computational methods, materials processing, heat and mass transfer experimentation and modeling, weld metallurgy of ODS materials, weld integrity evaluation and nondestructive evaluation of welds.

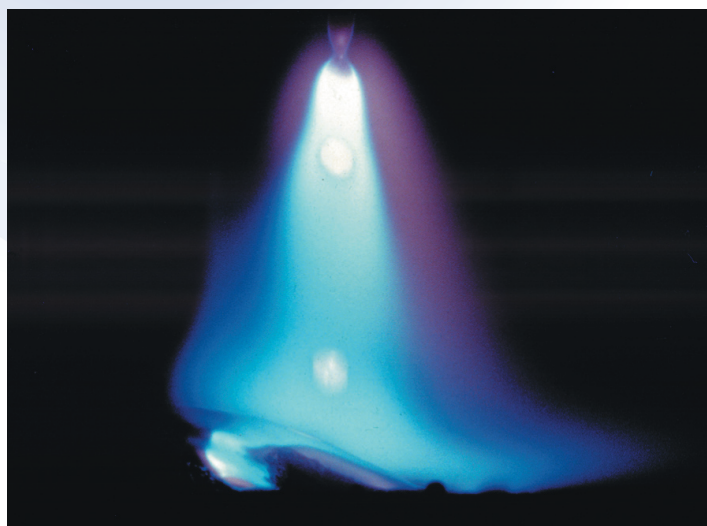
Staff

H.B. Smartt, C.R. Tolle, A.D. Watkins, R. Fielding, D. Baird.

Recent Projects

- Design and fabrication of prototype weld cell, Yucca Mountain BSC, \$2M/year
- In-process arc weld inspection, Saipem, \$2M/year
- Complex Intelligent Machines, DOE Office of Basic Energy Sciences, \$500K/year
- Laser-assisted arc welding, American Iron and Steel Institute, \$300K/year
- Joining ODS Alloys, DOE Office of Nuclear Energy, Generation IV reactor program, \$250K
- Encapsulation of AFC-1 TRU fuel test
- Friction stir-welding development for Reduced Enrichment Research and Test Reactor fuel plates
- Radioisotope thermal generator fabrication

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Droplet transfer in gas metal arc welding. This is a nonlinear, chaotic dynamic process. The droplets are responsible for essentially all of the mass transfer, and approximately 50% of the heat transfer from the process to the weld.

Science

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Collaborations

- “Laser-Assisted Arc Welding of High Strength Steels for Automotive Applications,” Oak Ridge National Laboratory, Y-12, Trumpf Inc., Lumonics, ISPAT INLAND Inc., Bethlehem Steel, Tower Automotive, Johnson Controls, American Iron and Steel Institute consortium
- “In-Process Control of Tubing Microstructure,” Oak Ridge National Laboratory, Timkin Steel, University of British Columbia
- “Intelligent Control of Cupola Melting of Iron,” Albany Research Center, Utah State University, American Foundry Society consortium

Publications

- “Intelligent Control of Modular Robotic Welding Cell,” H.B. Smartt, K.L. Kenney, C.R. Tolle, *Trends in Welding Research*, ASM International, ISBN 0-87170-780-2, p. 985, 2003.
- “Is There Evidence Of Determinism in Droplet Detachment Within the Gas Metal Arc Welding Process?” C.R. Tolle, R.A. LaViolette, et al., *Trends in Welding Research*, ASM International, ISBN 0-87170-780-2, p. 380, 2003.
- “Method for the Concurrent Ultrasonic Inspection of Partially Completed Welds,” J.A. Johnson, E.D. Larsen, K.S. Miller, H.B. Smartt, T.R. McJunkin, United States Patent 6,484,584, November 26, 2002.

For more information

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